

FLORA OF PANAMA¹

Part VI

FAMILY 92. MELIACEAE²

By C. EARLE SMITH, JR.

Trees or shrubs. *Leaves* alternate, rarely otherwise, usually pinnately or palmately compound, occasionally simple, estipulate; leaflets generally entire, at times with pellucid lines or dots. *Inflorescence* axillary or terminal, usually paniculate. *Flowers* regular, perfect, rarely polygamodioecious, 4- to 6-merous, but basically 5-merous; calyx and corolla either imbricate or valvate; petals free or rarely barely connate or adnate to the lower part of the staminal tube or gynophore; stamens usually twice as many as the petals, sometimes only as many as the petals, rarely more than twice as numerous, usually united partly or wholly into a tube; anthers 2-celled, longitudinally dehiscent; disk sometimes wanting, usually annular or cupular, free or adnate to the androecium or gynoecium; ovary of 2-6 united carpels, 2- to 12-celled; stigma discoid or capitate, simple or sulcate; ovules 2 or more in each cell, collateral or superposed, rarely solitary. *Fruit* capsular, septicidally or loculicidally dehiscent, sometimes drupaceous or baccate; seeds solitary to numerous in each cell, sometimes winged; endosperm carnose or none; embryo straight or transverse, the cotyledons fleshy or foliaceous; radicle superior or lateral.

A family of about 45 genera in the tropics and subtropics of both hemispheres. Among the trees are a number of species widely cut for lumber. In the American tropics the preferred sources of lumber are mahogany or *caoba* (*Swietenia* spp.) and Spanish cedar or *cedro* (*Cedrela* spp.) in that order followed by the many other trees cut for lumber. Mahogany, *cedro* and the Asiatic china-berry (*Melia Azederach* L.) are widely planted as ornamentals while *cedro* has also been used as a coffee shade tree and has been widely planted for reforestation.

The taxonomy of several of the American genera is in chaotic condition with many more species names in the literature than exist among the herbarium specimens. In order to arrive at the probably correct names for Panamanian species of *Guarea* and *Trichilia*, all of the Panamanian material of these and other Meliaceae genera from the Harvard University Herbaria, the U. S. National Herbarium, and the herbarium of the Missouri Botanical Garden were compared with the large collection of American *Meliaceae* at the Chicago Natural History Museum. Where types were available and the interpretation of the species was secure, reductions

¹ The Flora of Panama by Robert E. Woodson, Jr. and Robert W. Schery and Collaborators should be cited as: Ann. Missouri Bot. Gard., with volume number, pagination and date of the Annals.

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ANN. MISSOURI BOT. GARD. **52**: 55-79. No. 1. 1965.

were made as indicated in the synonymic lists in this paper. In all cases, the oldest name to which the taxon could be confidently assigned was used, but later study may find these judgments in error. Loans of authentic specimens of *Guarea glabra* Vahl from the Botanical Museum of Copenhagen and of *Trichilia tomentosa* H. B. K. and *T. montana* H. B. K. from the *Laboratoire de Phanérogamie*, *Muséum National d'Histoire Naturelle* of Paris are particularly appreciated.

- a. Leaves 2- to 3-pinnate; fruit drupaceous, flowers purple.1. MELIA
- aa. Leaves once pinnate or, rarely, 1- to 3-pinnate 3-foliate; fruit capsular or sub-baccate; petals not purple.
 - b. Filaments not connate; seeds winged.2. CEDRELA
 - bb. Filaments united for all or part of their length; seeds winged only in *Swietenia*.
 - c. Seeds bearing a large wing; disk cupular, thin.3. SWIETENIA
 - cc. Seeds not winged, arillate except in *Carapa*; disk annular or columnar.
 - d. Capsule dehiscent from the base upward; seeds not arillate; disk annular, carnose.4. CARAPA
 - dd. Capsule dehiscent from the apex downward; seeds arillate; disk thin-annular, columnar or obsolete.
 - e. Disk annular; anthers borne at the apex of the staminal tube.5. TRICHILIA
 - ee. Disk columnar or obsolete; anthers included in the staminal tube.6. GUAREA

1. MELIA L.

MELIA L., Sp. Pl. 384. 1753.

Azederach Mill., Gard. Dict. Abridg. ed. 4. 1754.

Azedara Raf., Fl. Ludov. 135. 1817.

Trees. Leaves alternate, pinnate or bipinnate, leaflets entire or, usually, dentate. *Inflorescence* an axillary panicle. *Flowers* purple, showy, 5- to 6-merous; petals contorted, spreading; staminal tube cylindric, dilated above, 10- to 12-dentate, each tooth cleft; anthers 10-12, included; disk annular; ovary 3- to 6-celled; stigma 5- to 6-lobate; ovules 2 in each cell, superposed. *Fruit* a drupe enclosing a 1- to 6-celled stone; seeds usually solitary in each cavity; endosperm carnose; cotyledons foliaceous, radicle terete, superior.

Old World trees largely restricted to the tropics and subtropics.

1. MELIA AZEDERACH L., Sp. Pl. 384. 1753.—Fig. 1.

Tree to 10 m. *Leaves* usually bipinnate, leaflets numerous, lanceolate to oval, 3-8 cm. long, the base acute to subcordate, the apex acute to acuminate, incised-serrate or lobate. *Inflorescences* 10-25 cm. long. *Flowers* slender-pedicellate; sepals 2-3 mm. long, lanceolate to ovate; petals purple or whitish, 8-12 mm. long; staminal tube deep purple; ovary glabrous. *Drupe*s globose, 1.5-2 cm. in diam., translucent-yellow; pit bony, sulcate.

A tree long in cultivation throughout the warm areas of the world; it occasionally escapes into hedgerows and along roadsides.

BOCAS DEL TORO: Almirante, Cooper 43. CHIRIQUÍ: Progreso, Cooper & Slater 290. CANAL ZONE: Cocoli, Riley 131.

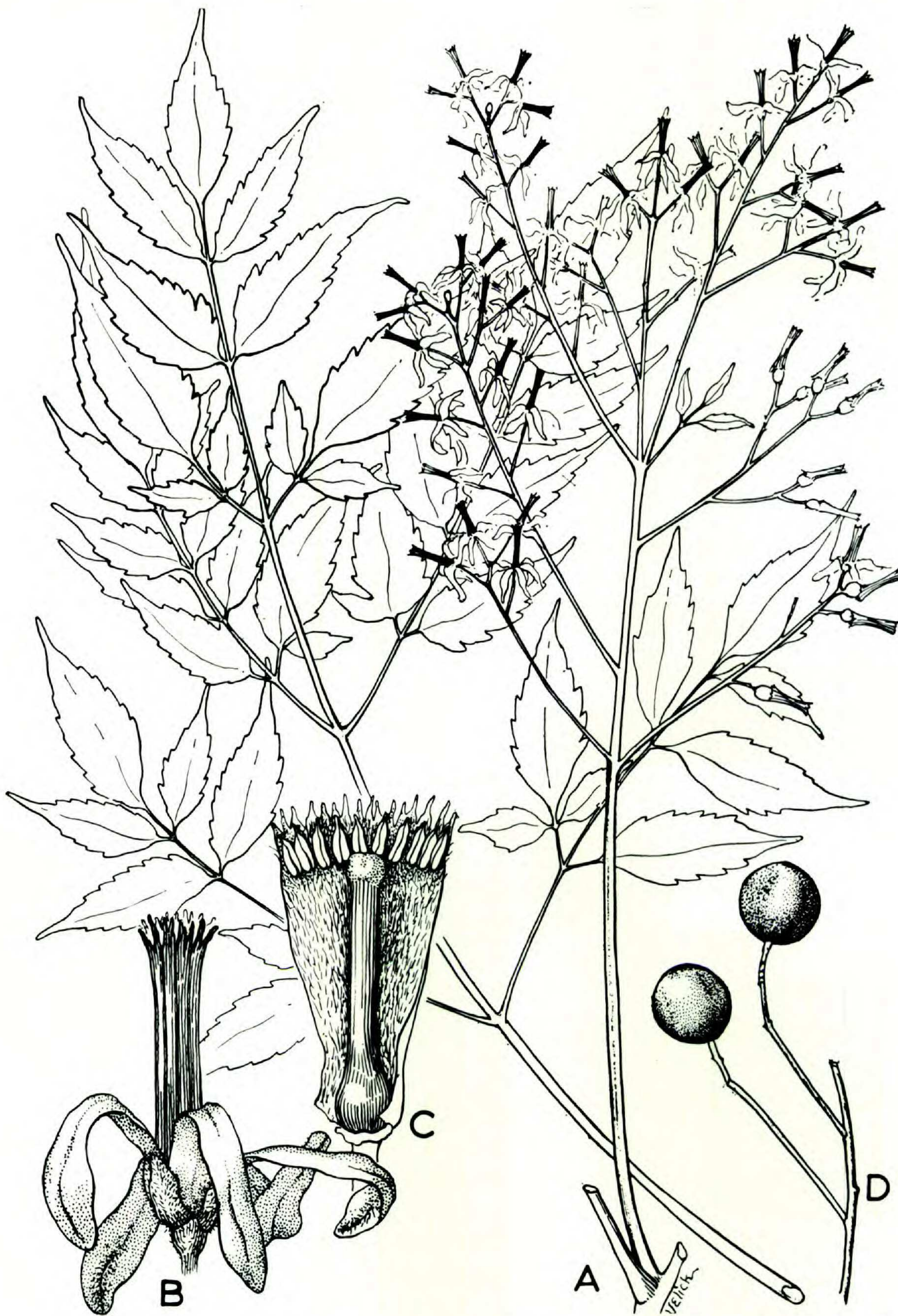


Figure. 1. *MELIA AZEDERACH* L.: A, leaf and inflorescence (ca. $\times \frac{2}{3}$); B, flower ($\times 3\frac{1}{3}$); C, id., calyx and petals removed, the androecium opened (ca. $\times 3\frac{1}{3}$); D, fruits (ca. $\times \frac{2}{3}$).

2. CEDRELA P. Br.

CEDRELA P. Br., Civ. Nat. Hist. Jamaica 158. 1756.

Cedrus Mill., Gard. Dict. ed. 7. 1759.

Johnsonia Adans., Fam. Pl. **2**: 343. 1763.

Pterosiphon Turcz., Bull. Soc. Imp. Nat. Mosc. **36**(1-2):589. 1863.

Surenus O. Ktze., Rev. Gen. Pl. **1**: 110. 1891.

Trees to 60 m. tall; trunk buttressed on old and large trees; branchlets sometimes conspicuously lenticellate. *Leaves* alternate, paripinnately compound, very variable in length, the leaflet pairs variable in number, 8-20 pairs, opposite or subopposite; leaflets ovate to lanceolate, generally acuminate, glabrous to densely pubescent, the margin entire, very variable in size and shape. *Inflorescence* terminal, pyramidal, paniculate, the branches generally at right angles to the axis. *Flowers* perfect, (4-) 5 (-6)-merous; calyx cupulate or lobed; petals spatulate to lanceolate and adnate to the gynophore along their lower $\frac{1}{3}$, entire, frequently fleshy; stamens with fleshy filaments adnate to the gynophore below, free above, as long as or shorter than the corolla; anthers introrsely dehiscent through a slit, the connective frequently prolonged into an apiculum; pistil borne at the apex of a gynophore, the ovary 5-celled with ovules hanging in 2 rows per cell on the central column; stigma capitate. *Fruit* a septicidally dehiscent capsule opening cleanly from the apex; seeds hanging from the thick central column, numerous, the seed coat continued as a membranous wing from the apex of the seed.

Cedrela is restricted to the American tropics from Mexico to Argentina where six species and possibly a seventh species are recognized.

- a. Calyx cupulate, split on one side, variously, but not deeply, dentate; capsule less than 5 cm. long, the valves 1-2 mm. thick.
 - b. Leaflets strongly oblique at the base, often glabrous; calyx usually glabrous, irregularly dentate; petals thin, evenly light in color; column in the capsule with wings extending to the base of the broad apex.1. *C. ODORATA*
 - bb. Leaflets slightly oblique at the base, puberulent to pubescent, particularly along the veins beneath; calyx puberulent, generally regularly 5-dentate; petals moderately thick, often darker in color at the apical margin; column in the capsule with wings extending to the base of the narrow apex.2. *C. ANGUSTIFOLIA*
- aa. Calyx regularly and deeply 5-lobate; capsule usually exceeding 6 cm. in length, the valves 2-3 mm. thick.3. *C. TONDUZII*

1. CEDRELA ODORATA L., Syst. Nat. ed. 10, 940. 1759.

Cedrela guianensis A. Juss., Mém. Mus. Hist. Nat. Paris **19**: 295. 1830.

Cedrela mexicana M. J. Roem., Fam. Nat. Regni Veg. Syn. Monogr. **1**: 137. 1846.

Tree to 40 m.; branchlets generally glabrous, occasionally conspicuously lenticellate, more often with small lenticels. *Leaves* with 5-11 pairs of leaflets 8-17 cm. long by 2.5-5.5 cm. wide, broadly lanceolate to ovate, the base acute to rounded, often markedly oblique, the apex acuminate obtuse, rarely acute, sometimes mucronulate, generally glabrous, occasionally puberulent or short pubescent along the veins beneath. *Inflorescences* open, variable in size, often shorter than the leaves, usually glabrous, rarely puberulent, the bracts caducous. *Flowers* 6-9 mm. long;

calyx cupulate and split on one side, 1.5-3 mm. deep, the margin generally shallowly and irregularly toothed, glabrous, rarely puberulent, light to dark in color; petals elliptical to subspatulate, puberulent without, uniformly light in color; filaments of the stamens thick but usually of uniform diam., the anthers short apiculate, 0.75-1.5 mm. long; ovary hemispherical to ovoid, usually glabrous, 1-2 mm. long, style 1.5-2 mm. long, the capitate stigma about 0.5 mm. thick. *Fruit* 2.5-4.5 cm. long, the valves thin, the central column with wings extending to the base of the broadened apex.

Trees of dry to moist soils at lower elevations, frequent in second-growth forest but largely cut before attaining a very large trunk diameter. The species ranges from the West Indies and northern Mexico to the Amazon drainage of Brazil but it is largely restricted to the area of Caribbean drainage in Panama. It is frequently planted as a street tree.

CHIRIQUÍ: Progreso, Cooper & Slater 306.

Wherever *C. odorata* is growing in close proximity to *C. angustifolia*, hybridization can be expected between the two species. The progeny will not separate clearly into either species on any character currently known to me. To date the *cedros* collected in Panama have not shown this intermixing, but it is certainly to be anticipated as more specimens become available.

2. *CEDRELA ANGUSTIFOLIA* Sessé & Moc. ex DC., Prodr. **1**: 624. 1824.

Cedrela brasiliensis A. Juss. in St.-Hil., Fl. Bras. Merid. **2**: 86, t. 101. 1829.
Cedrela fissilis Auct. non Vell.

Tree to 60 m., usually 30 m. or less, with upright branches and an open crown; branchlets with small lenticels, glabrous or glabrate. *Leaves* with 5-10 pairs of leaflets 9-25 cm. long by 3-8.5 cm. wide, elliptical to ovate to ovate-lanceolate, seldom lanceolate, the base subacute to rounded, slightly oblique, the apex obtuse to long-acuminate, pubescent along the midrib above, scantily puberulent to thickly pubescent and scattered hirsute, primarily on the veins and venules below, sometimes glabrous or with the axils of the secondary veins barbate. *Inflorescences* variable in size, often about equalling the length of the leaves, usually puberulent; bracts caducous. *Flowers* 6-9 mm. long; calyx shallowly cupulate and usually split at one side, 2-3 mm. deep, the margin irregularly shallowly lobed to definitely 5-lobed, often scattered puberulent, dark in color; petals elliptical, densely pubescent, reddish near the apex; filaments of the stamens fleshy, the anthers apiculate, 0.8-1.9 mm. long; ovary 1-1.5 mm. long, hemispherical, puberulent; style 1.5-3 mm. long, thick, puberulent; capitate stigma about 0.5 mm. thick, glabrous. *Fruit* 2.5-5 cm. long, the valves thin (to 1.5 mm. thick), the central column with 5 conspicuous wings extending nearly to the narrow apex.

Trees of dry to moist sites at less than 2,000 m. elevation, conspicuous in second-growth before they are cut, ranging from northern Mexico to northern Argentina. Frequently planted as ornamental trees.

CHIRIQUÍ: Progreso, Cooper & Slater 252, 305. DARIEN: vicinity of El Real, Río Tuira, Stern, Chambers, Dwyer & Ebinger 745. HERRERA: Ocu, Allen 4082. COCLÉ: Aguadulce, Pittier 4985. CANAL ZONE: Curundú, Harvey 5256, Smith & Smith 3254. PANAMA: Alhaguela, Pittier 3729; Cerro Campana, Allen 2081; Punta Paitilla, Standley 30793; San José Island, Erlanson 303, Johnston 323; Soto Caballo, Smith, Smith & Arauz 3322; Guayabito, Smith & Smith 3448.

3. *CEDRELA TONDUZII* C. DC., Bull. Herb. Boiss., ser. 2, **5**: 427. 1905.

Cedrela salvadorensis Standley, Field Mus. Nat. Hist., Bot. Ser. **4**: 215. 1929.

Tree to 40 m. (fide Little 6077); branchlets often thick, sometimes conspicuously lenticellate. *Leaves* with 5-7 pairs of leaflets 7.5-14 cm. long by 2.5-6.0 cm. wide, lanceolate to elliptical, the base acute to rounded, subequilateral, the apex acuminate obtuse to acute, rarely glabrate, the veins usually pubescent above, the lower surface densely puberulent to pilose. *Inflorescences* sometimes dense, usually shorter than the leaves, puberulent; bracts subpersistent, to 1.5 mm. long, puberulent. *Flowers* 5-7 mm. long; calyx shallowly to deeply 5-lobed, occasionally split to the base on one side, 1-1.5 mm. deep, generally puberulent; petals elliptical, thickened at the center, puberulent to short pilose without, light at the base shading to rose at the apex along the margins; stamens with the filaments thick-fleshy where they are adnate to the gynophore, narrowing abruptly above, the connective wide, ending in a marked apiculum, the anthers 1-1.9 mm. long; ovary ovoid, glabrous; style usually 2-3 mm. long, glabrous; capitate stigma usually about 0.75 mm. thick. *Fruit* 6-10 cm. long, the valves heavy, usually at least 2 mm. thick, the outer surface lenticellate, smooth; central column with 5 wings extending to the apex over the broad end, the scars from seed attachment extending basally about $\frac{1}{3}$ the length of the column.

Trees of moist areas at elevations up to 2,000 m., ranging from Chiapas, Mexico to Chiriquí Province in Panama.

CHIRIQUÍ: Río Chiriquí Viejo, Little 6077; near Finca Lerida, Allen 4751.

In my monograph on *Cedrela* (Fieldiana: Bot. **29**: 295-341. 1960) this species is confused with *C. oaxacensis* C. DC. & Rose. Since that time, Dr. Faustino Miranda has kindly brought to my attention specimens showing that the large capsules of *C. tonduzii* are produced several together on a hanging inflorescence. Previous collections have only single detached capsules with no indication of the shape of the fruiting inflorescence. *C. tonduzii* is generally restricted to moist, evergreen forests, whereas *C. oaxacensis* is a tree of deciduous forests in southern Mexico.

3. *SWIETENIA* Jacq.

SWIETENIA Jacq., Enum. Syst. Pl. 4, 20. 1760.

Mahogani Adans., Fam. Pl. **2**: 343. 1763, pro parte.

Roia Scop., Intr. Hist. Nat. 226. 1777.

Trees. *Leaves* alternate, pari- (rarely impari-) pinnate; leaflets 2-6 pairs, opposite, inequilateral, entire. *Inflorescences* axillary, paniculate. *Flowers* whitish,

(4-) 5-merous; calyx lobed, imbricate; corolla imbricate; staminal tube urceolate, 10-dentate, the anthers 10, included; disk cupulate, the margin crenulate; ovary sessile in disk, glabrous; stigma discoid; ovules numerous in each cell, pendulous. *Fruit* large, capsular, septicidally dehiscent from the base, the valves separating into 2 layers, adnate to the central column at the apex; seeds numerous in each locule, the seed-coat developed into a large wing between the placenta and the seed; endosperm thin, carnose; embryo transverse, the cotyledons large, the radicle short.

A genus of three closely related species of which only one is represented by herbarium specimens from Panama.

1. *SWIETENIA MACROPHYLLA* G. King in Hook., Icon. Pl. **16**: t. 1550. 1886.—Fig. 2.

Tree to 30 m. *Leaves* to 30 cm. long, largely paripinnate; leaflets 3-5 pairs, opposite, 6-14 cm. long, 3-6 cm. wide, inequilateral, ovate to elliptical, the base obtuse to acute, the apex acuminate, acute. *Inflorescences* axillary, 10-20 cm. long or longer, glabrous. *Flowers* usually 5-merous; calyx 2-2.5 mm. in diam., the lobes rounded; petals obovate, white; staminal tube cylindric-urceolate, the teeth acute or acuminate. *Capsule* ovoid, 12-15 cm. long, to 7 cm. in diam.

Moist forests of the Caribbean watershed of Mexico and Central America, southward into Brazil and Peru. The mahogany trees or *caobas* have been very thoroughly harvested in all accessible localities in Panama and it is now impossible to ascertain its former distribution. Probably the smaller *caoba* of the Pacific side of Mexico and Central America formerly came into Panama, but it grew in the more open forests of better-drained areas which would have been easily logged.

PANAMA: Juan Díaz, *Fisher* 3, 4, 11.

4. *CARAPA* Aubl.

CARAPA Aubl., Hist. Pl. Gui. Fr. Suppl. 32. 1775.

Persoonia Willd. in L., Sp. Pl. ed. 4 [i.e. 5], **2**: 331. 1799.

Amapa Steud., Nom. Bot. ed. 1, 69. 1821.

Granatum O. Ktze., Rev. Gen. Pl. **1**: 110. 1891.

Trees. *Leaves* alternate, pari- or impari-pinnate; leaflets entire, usually coriaceous. *Inflorescences* terminal or axillary. *Flowers* perfect, 4- to 5-merous; sepals imbricate; petals free, alternate with the sepals; staminal tube cupular or ovoid, 8- to 10-lobate, the lobes cleft or entire; anthers 8-10, sessile within the tube at the base of the sinuses; disk annular, carnose; ovary sessile, 4- to 5-sulcate, 4- to 5-celled; style short; stigma discoid; ovules 2-8 in each cell, biserial or superposed. *Fruit* a large capsule, 1- to 5-celled, subglobose or ovoid, ligneous or carnose, the cells 2- to 5-seeded; seeds large, angulate, without endosperm, the testa corky; radicle lateral.

Several species are known from tropical America and Africa. The following descriptions and citations have been modified from a manuscript sent to the author



Figure 2. *SWIETENIA MACROPHYLLA* G. King: A, leaves (ca. $\times \frac{2}{3}$); B, inflorescence (ca. $\times \frac{2}{3}$); C, flower bud (ca. $\times 6\frac{2}{3}$); D, flower ($\times$ ca. $3\frac{1}{2}$); E, seed (ca. $\times \frac{1}{2}$).

by Dr. Hugh Iltis, University of Wisconsin, Madison, who has been interested in this genus for some years. The use of this material is very much appreciated.

- a. Flowers sessile; sepals and petals glabrous; developing structures at branch tip glabrous to scurfy.1. *C. GUIANENSIS*
- aa. Flowers pedicellate; sepals and petals usually puberulent or tomentose; developing structures at branch tip brown-tomentose.2. *C. NICARAGUENSIS*

1. *CARAPA GUIANENSIS* Aubl., Hist. Pl. Gui. Fr. Suppl. 32, tab. 387. 1775.

Persoonia guareoides Willd. in L., Sp. Pl. ed. 4 [i.e. 5], 2: 331. 1799.

Amapa guinaensis (Aubl.) Steud., Nom. Bot. ed. 1, 69. 1821.

Granatum guianense (Aubl.) O. Ktze., Rev. Gen. Pl. 1:110. 1891.

Guarea mucronulata C. DC., Notizbl. K. Bot. Gart. Mus. Berlin 7: 499. 1917.

Tree, medium to large, up to 50 m. tall. *Leaves* crowded at the ends of the branches, paripinnate, 24-60 cm. long; leaflets 3-7 (-9) pairs, elliptic-oblong or ovate-oblong to narrowly lanceolate or oblanceolate, the base cuneate to rounded, the apex rounded, apiculate or cuspidate, sometimes rounded to acute or acuminate, 11-48 cm. long, 3.5-15.5 cm. wide, glabrous on both surfaces. *Inflorescences* axillary, paniculate; bracts and bracteoles persistent, glabrous. *Flowers* white to yellowish or greenish, also dull red or purple, sessile to subsessile, 4-5 mm. long, 4-merous; sepals rounded or broadly ovate; petals imbricate in bud; staminal tube cupulate to urceolate, 8-toothed, the teeth truncate, emarginate or irregularly toothed; anthers 8; disk shallow or concave and ridged; ovary 4-angulate, 4-celled; ovules 2 per cell. *Fruit* globose, 4-ridged, sometimes warty on the ridges; seeds 7-8, dark brown.

Moist forests particularly along rivers from the West Indies and British Honduras to Brasil. While no specimens have been collected from Panama, its presence in Costa Rica and Colombia indicates that this species is to be found in the forests of the Caribbean watershed of Panama.

2. *CARAPA NICARAGUENSIS* C. DC., Monogr. Phaner. 1: 717. 1878.—Fig. 3.

Granatum nicaraguense (C. DC.) O. Ktze., Rev. Gen. Pl. 1: 110. 1891.

Carapa Slateri Standley, Trop. Woods 10: 48. 1927.

Tree, medium to large, up to 30 m. tall. *Leaves* pari- or impari-pinnate, 32-66 cm. long, the rachis lenticellate and terminated by a glandular, tomentose projection in the absence of a terminal leaflet; leaflets 4-6 (-7) pairs, oblanceolate, the base cuneate to rounded, the apex broadly acute to rounded or retuse with a small, tomentose mucro, 8.5-48 cm. long, 4.5-15 cm. wide, the veins brown-tomentose, the blades scattered tomentose above and below. *Inflorescences* axillary, paniculate, tomentose; bracts and bracteoles persistent, tomentose. *Flowers* subsessile or pedicellate, white, aromatic, 0.7-4 mm. long, 4-merous; sepals suborbicular to ovate, tomentose or glabrate; petals dotted with 1-2 glands on the outside; staminal tube urceolate, 8-toothed, the teeth truncate-emarginate, or broadly bifid; anthers 8; disk fleshy; ovary 4-angulate, 4-celled; ovules 2 per cell. *Fruit* cylindrical, to 16 cm. long, 4-valved; seeds yellow-ochre, rarely brown with whitish specks.

Lowland forest from Nicaragua to Ecuador.

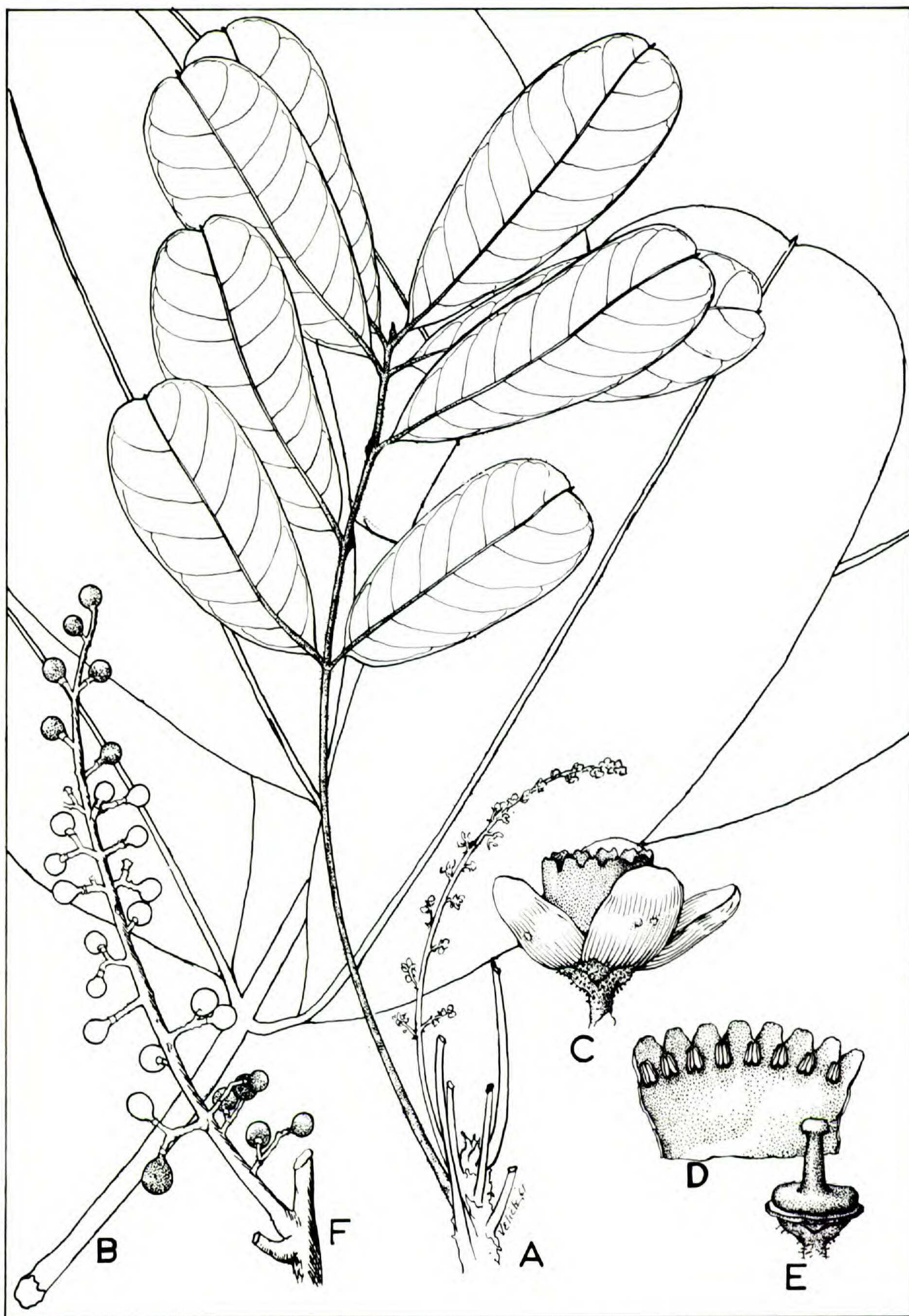


Figure 3. *CARAPA NICARAGUENSIS* C. DC.: A, habit (ca. $\times \frac{1}{2}$); B, mature leaf (ca. $\times \frac{1}{3}$); C, flower (ca. $\times 6$); D, staminal tube opened (ca. $\times 6$); E, gynoecium (ca. $\times 6$); F, very young fruits (ca. $\frac{1}{3}$).

BOCAS DEL TORO: Changuinola Valley, Almirante region, *Cooper & Slater* 59, 59a; vicinity of Guabito between Changuinola River and Simaola River, *Stern & Chambers* 116; Comarca del Barú, Puerto Armuelles between Canazo and Cocos, *Cooper & Slater* 282. CANAL ZONE: 2 miles south of Fort Sherman, *Johnston* 1824. DARIEN: Punta Guayabo Chiquita, *Stern & Chambers* 166; along Río Tuira below El Real and Piriaque Island, *Stern, Chambers, Dwyer & Ebinger* 969.

5. TRICHILIA L.

TRICHILIA L., Syst. Nat. ed. 10, 1020. 1759.

Portesia Cav., Mon. Cl. Diss. Dec. 7: 369. 1789.

Odontandra Roem. & Schult. in L., Syst. Veg. ed. 16, 5: 511. 1819.

Moschoxylum A. Juss., Mém. Mus. Hist. Nat. Paris 19: 238. 1830.

Acrilia Griseb., Fl. Brit. W. Ind. Isl. 129. 1859.

Pholacilia Griseb., loc. cit. 129. 1859.

Acanthotrichilia (Urban) Cook & Collins, Contr. U. S. Nat. Herb. 8: 65, 238. 1903.

Trees or shrubs. Leaves alternate, odd- or even-pinnate, trifoliate or, rarely unifoliate; leaflets opposite or alternate, usually entire (but spiny-margined in a few species of the West Indies). Flowers hermaphroditic in axillary (terminal?) panicles; calyx flat or cupulate, 4- to 5-lobed or the sepals nearly distinct; petals (3-) 4-5, free or connate at the base, imbricate or valvate; stamens 4 to usually 8 or 10, the filaments generally broad and united at or above the base, sometimes with a pair of processes at either side of the anther; anthers always terminal and erect; ovary 2- or 3-celled, sometimes short-stipitate; stigma capitate or disk-like, 2- to 3-lobed; ovules 1 or 2 per cell, laterally paired or superposed. Fruit 2- or 3-loculed, loculicidally dehiscent from the apex, the locules 1- or 2-seeded; seeds inverted; testa thin, coriaceous; cotyledons fleshy; radicle superior.

The distinctions between species of *Trichilia* are frequently very tenuous. Some 200 species of tropical America and Africa have been proposed, but the American species probably number less than 50.

Occasionally there is a conspicuous annular disk within the flower which may be adnate to the staminal ring or the ovary.

- a. Staminal tube entire, the anthers may alternate with apicula.
 - b. Leaf-rachis to 15 cm. long; leaflet-apex rounded or obtuse, rarely acuminate.1. *T. GLABRA*
 - bb. Leaf-rachis 20-40 cm. long; leaflet-apex acuminate to acuminate-obtuse in *T. Cibo* and/or the midrib markedly raised on the upper leaf-surface.
 - c. Calyx of nearly free, imbricate sepals.2. *T. MORITZII*
 - cc. Calyx lobed, the lobes never imbricate.
 - d. Staminal tube about $\frac{1}{2}$ the height of the petals; stigma thick-capitate; capsule smoothly velutinous.3. *T. JAPURENSIS*
 - dd. Staminal tube $\frac{2}{3}$ - $\frac{3}{4}$ the height of the petals; stigma disk-like; capsule glabrous, muricate.4. *T. CIPO*
 - aa. Staminal tube lobed for $\frac{1}{3}$ or more of its height.
 - e. Leaf-rachis 1-1.5 cm. long; leaves 1- to 3-foliate.5. *T. TRIFOLIA*
 - ee. Leaf-rachis much longer; leaflets 2 or more pairs.
 - f. Inflorescences less than 4 cm. long, sometimes appearing to be fascicled; capsule ellipsoidal, usually golden-velutinous.6. *T. MONTANA*
 - ff. Inflorescences 5 cm. long or longer; capsule sphaeroidal or obpyramidal, reddish-velutinous.
 - g. Inflorescences racemose; capsule usually 2- to 4-seeded.7. *T. HIRTA*
 - gg. Inflorescences paniculate, sometimes crowded; capsule usually 1-seeded.8. *T. TOMENTOSA*

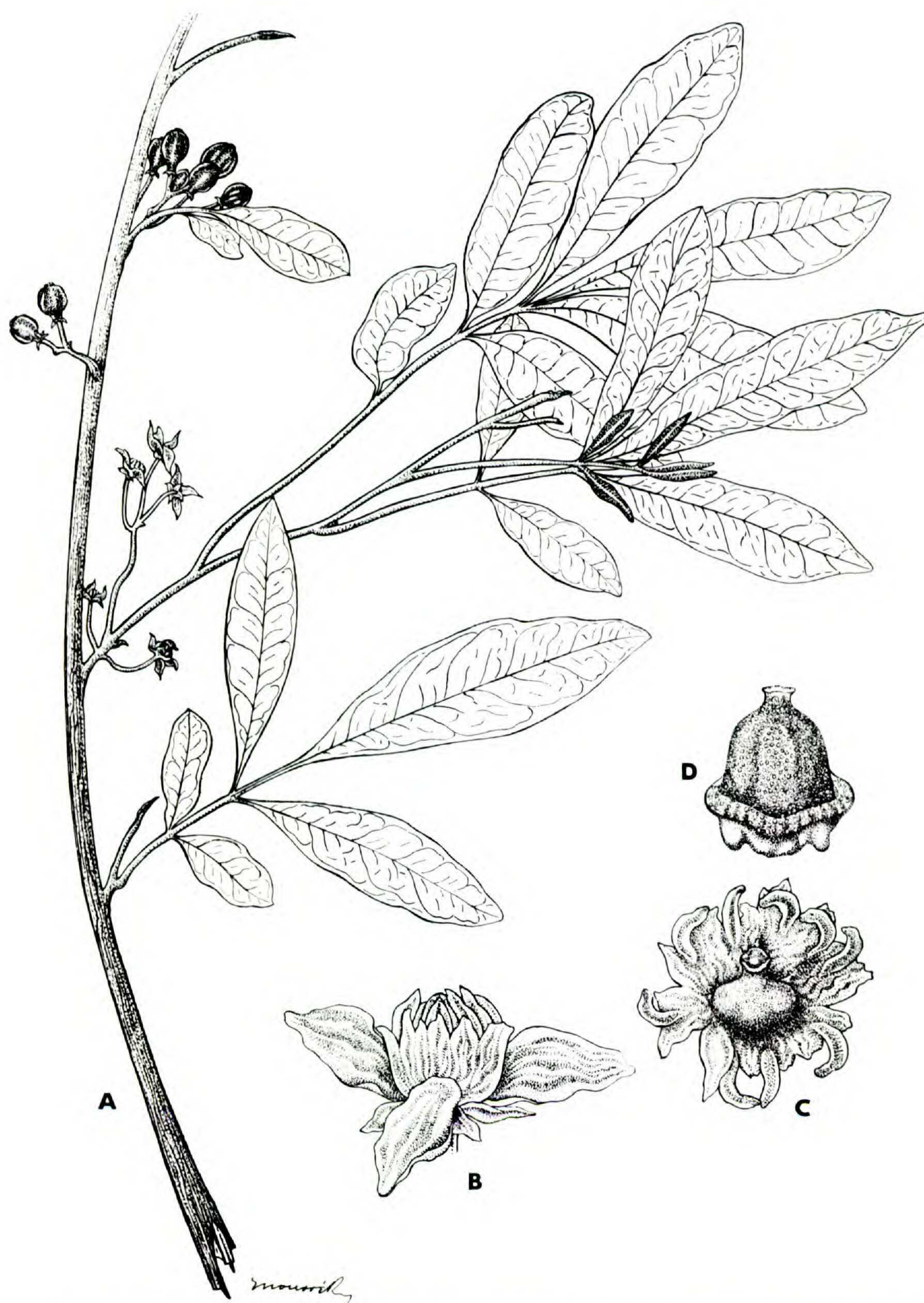


Figure 4. *TRICHILIA GLABRA* L.: A, habit ($\times 1$); B, flower ($\times 8$); C, staminal tube opened and gynoecium ($\times 8$); D, gynoecium ($\times 16$).

1. *TRICHILIA GLABRA* L., Syst. Nat. ed. 10, 1020. 1759.—Fig. 4.*Trichilia havanensis* Jacq., Enum. Syst. Pl. 20. 1760.*Trichilia emarginata* C. DC., Monogr. Phaner. **1**: 701. 1878.*Trichilia Oerstediana* C. D.C., loc. cit. 677. 1878.*Trichilia Donnell-Smithii* C. DC., Bot. Gaz. **19**: 2. 1894.*Trichilia alajuelana* C. DC. in J. D. Sm., Enum. Pl. Guatemal. **5**: 13. 1899, *nom. nud.**Trichilia Davidsoniae* Standley, Field Mus. Nat. Hist., Bot. Ser. **22**: 85. 1940.

Shrub or small tree to 8 m. tall, rarely a larger tree. *Leaves* to 15 cm. long; leaflets 2-5 pairs borne oppositely on the rachis, occasionally imparipinnate; blades 2.5-14 cm. long, 1.5-7 cm. wide, obovate, sometimes nearly cuneate, elliptical or nearly lanceolate, the base acute, the apex rounded to obtuse, rarely acuminate, glabrous to pubescent along the midrib above and along the veins beneath. *Inflorescences* axillary, short-racemose, usually less than 3 cm. long. *Flowers* white or greenish, 2-3 mm. long, 4- to 6-merous; calyx nearly flat, the lobes deltoid, glabrous to pubescent without, glabrous within; petals ovate to lanceolate, thin, glabrous to short-scattered-puberulent without; staminal tube $\frac{1}{3}$ - $\frac{2}{3}$ the length of the petals, glabrous or puberulent near the top; anthers usually twice as many as the petals, alternating with deltoid lobes which are nearly as long; ovary and style glabrous, the stigma thick-capitate. *Fruit* sphaeroidal, glabrous, smooth before dehiscence, the 3-4 valves transversely striate-rugulose after opening flat or reflexing to expose the 1 or 2 red-arillate seeds.

Forest understory and in fence rows in the West Indies and Mexico to Panama.

CHIRIQUÍ: valley of upper Río Chiriquí Viejo, *White & White* 109; El Boquete, alt. 1,000-1,300 m., *Pittier* 3144; Bajo Choro, *Davidson* 347.

2. *TRICHILIA MORITZII* C. DC., Monogr. Phaner. **1**: 707. 1878.*Trichilia polyneura* C. DC., Bull. Herb. Boiss. ser. 2, **5**: 426. 1905.*Trichilia eurysepala* Harms, Notizbl. Bot. Gart. Mus. Berlin **10**: 246. 1928.

Tree to 15 m. tall. *Leaves* to 40 cm. long, paripinnate; leaflets 3-5 pairs borne suboppositely or alternately on the rachis, one leaflet of the apical pair becoming terminal; blades 6-30 cm. long, 2.5-14 cm. wide, elliptical to broadly so, the base acute, the apex short-acuminate, subacute, glabrous to puberulent along the veins above and below. *Inflorescences* axillary, 3-20 cm. long, the axis and branches usually densely velutinous, racemose-paniculate. *Flowers* white or cream, 4-5 mm. long, 4- to 6-merous; sepals and petals deeply imbricate, frequently minutely resinous-dotted; calyx of nearly free sepals, these large, rounded, generally turned and wrinkled in herbarium specimens, velutinous without; corolla velutinous without, glabrous within, the petals obovate; staminal tube $\frac{3}{4}$ the height of the corolla, sparingly puberulent to puberulent without, the anthers usually twice as many as the petals alternating with apicula nearly as long, the tube sometimes breaking into filaments at the apex and the anther is then subtended by 2 apicula. *Fruit* unknown.

A tree of apparently sporadic occurrence in the Lesser Antilles and ranging from Costa Rica to Peru and Venezuela.

CHIRIQUÍ: Progreso, *Cooper & Slater* 194.

3. *TRICHILIA JAPURENSIS* C. DC. in Mart., Fl. Bras. **11**(1):214. 1878.*Moschoxylon pentandrum* Poepp. & Endl., Nov. Gen. Sp. Pl. **3**:39. 1843.*Trichilia Tocachaeana* C. DC., Monogr. Phaner. **1**:701. 1878.*Moschoxylon pachypodum* Rusby, Mem. Torrey Bot. Club **6**:17. 1896.*Trichilia LeCointei* Ducke, Archiv. Jard. Bot. Río de Janeiro **3**:130, 191. 1922.*Trichilia Froesii* A. C. Sm., Bull. Torrey Bot. Club **61**:193. 1934.*Trichilia erythrocarpa* Lundell, Bull. Torrey Bot. Club **64**:551. 1937.*Trichilia Matudae* Lundell, Lloydia **2**:94, tab. 5. 1939.*Trichilia pachypoda* (Rusby) C. DC. ex Harms in Engl. & Prantl, Nat. Pflanzenf. ed. 2, **19b1**:114. 1940.

Tree to 25 m. tall. *Leaves* to 40 cm. long; leaflets 4-7 pairs borne alternately on the rachis with one leaflet of the terminal pair oriented in line with the rachis to simulate a terminal leaflet; blades 5-18 cm. long, 2-6 cm. wide, lanceolate-elliptical to obovate, the base acute, sometimes cuneate, the apex acuminate, sub-acute to acute, glabrous to scattered-puberulent beneath and along the midrib above. *Inflorescences* axillary, racemose-paniculate, 5-25 cm. long, glabrate to usually puberulent over-all. *Flowers* cream, 2-3 mm. long, 4- to 6-merous; calyx cupulate, the margin nearly entire or shallowly lobed, the lobes short-deltoid, scattered-puberulent to pubescent without, glabrous within; corolla scattered-puberulent to pubescent without, glabrous within; staminal tube about $\frac{1}{2}$ the height of the corolla, glabrous or scattered-puberulent without, the anthers usually twice as many as the corolla lobes, alternating with apicula about $\frac{1}{3}$ the length of the anthers; ovary pubescent, the stigma thick-capitate. *Fruit* salmon to bright red, elongate, ellipsoidal, the valves 2-3 or 4, very thin, densely short-velutinous frequently with dense patches of longer, lighter trichomes at the base, the calyx frequently persistent; seeds usually solitary in the capsule, arillate.

Wide ranging, lowland species from southern Mexico to the Amazon basin.

BOCAS DEL TORO: Changuinola Valley, Almirante region, *Cooper & Slater* 52. DARIEN: Cana-Cuasi trail, *Davidson* 1457; La Palma, *Pittier* 6960; Marraganti, *R. S. Williams* 1015.

The group of species of *Trichilia* to which *T. japurensis* belongs is much confused. Only a thorough monograph of the genus will finally settle the specific differences between this species and *T. moschata* Sw. as they intergrade completely along the Caribbean coast.

4. *TRICHILIA CIPO* (A. Juss.) C. DC. in Mart., Fl. Bras **11**(1):214. 1878.*Moschoxylum Cipo* A. Juss., Mém. Mus. Hist. Nat. Paris **19**:280. 1830.*Moschoxylum multiflorum* Karst., Fl. Columb. **2**:71, tab. 136. 1863.*Trichilia verrucosa* C. DC., Monogr. Phaner. **1**:695. 1878.*Trichilia tuberculata* C. DC., loc. cit. 711. 1878.*Trichilia Steinbachii* Harms, Notizbl. Bot. Gart. Mus. Berlin **9**:1156. 1927.

Tree to 25 m. tall. *Leaves* to 30 cm. long; leaflets 3-6 pairs borne alternately on the rachis (rarely oppositely), 1 leaflet of the terminal pair sometimes oriented with the axis to simulate the terminal leaflet of an imparipinnate leaf; blades 4-17 cm. long, 1.5-6.5 cm. wide, lanceolate to elliptical, occasionally somewhat obovate, the base usually acute, the apex obtuse to acuminate-obtuse, the midrib markedly

raised above; leaflets and rachis glabrous, very rarely minutely puberulent. *Inflorescences* axillary, paniculate, 5-20 cm. long, glabrous to scattered-puberulent. *Flowers* white or greenish, 4- to 6-merous, 2-3 mm. long; calyx saucer-shaped, the lobes deltoid, glabrous to pubescent without; petals puberulent or pubescent without, glabrous within; staminal tube $\frac{2}{3}$ - $\frac{3}{4}$ the height of the corolla, glabrous or scattered-pubescent without; anthers as many as or twice as many as the corolla lobes, alternating with an apiculum $\frac{1}{3}$ - $\frac{1}{2}$ the length of the anthers; ovary and style generally pubescent, the stigma disk-like. *Fruit* red to brown, ellipsoidal, muricate, 3- to 4-valved, with only 1 or 2 seeds developing per fruit; seeds covered with a red aril.

Moist forests at low elevations from Guatemala to Bolivia.

BOCAS DEL TORO: Water Valley, *von Wedel* 691. CANAL ZONE: Gatún Lake, *Bangham* 434, 618; Barro Colorado Island, *Aviles* 1141, *L. H. & E. Z. Bailey* 394, *Zetek* Z-5073 Fort San Lorenzo, *Johnston* 1517 CHIRIQUÍ: Progreso, *Cooper & Slater* 240; Puerto Armuelles, alt. 0-75 m., *Woodson & Schery* 902; Comarca del Barú, *Stern & Chambers* 146.

5. *TRICHILIA TRIFOLIA* L., *Syst. Nat.* ed. 10, 1020. 1759.

Trichilia Palmeri C. DC., *Bot. Gaz.* **19**: 39. 1894.

Trichilia unifoliola Blake & Standley, *Jour. Wash. Acad. Sci.* **15**: 103. 1925.

Shrub or tree to 10 m. tall. *Leaves* 1-1.5 cm. long, 1- or 3-foliate; leaflets 1.5-7 cm. long, 1-4 cm. wide, obovate to elliptical, the base subacute, the apex emarginate to rounded, rarely obtusely short-acuminate, glabrous on both sides, rarely with the rachis, petiolules and principal veins scattered-puberulent. *Inflorescences* axillary, crowded-racemose and appearing to be fascicled, glabrous or scattered puberulent; bracts persistent, deltoid-naviculate. *Flowers* white, 4- to 6-merous, 2-3 mm. long; calyx cupulate, shallowly lobed, the lobes deltoid, glabrous; corolla glabrous; stamens twice as many as the petals, nearly the same height as the corolla, united for the basal $\frac{1}{3}$; filaments broad, glabrous without, pilose within, tipped with 2 elongate, deltoid apicula which may nearly hide the anther from without; ovary densely sericeous; stigma sphaeroidal-capitate. *Fruit* an obovoid capsule 0.5-0.75 cm. long, glabrate or scattered pilose, usually 3-valved, 1- to 2-seeded; seeds arillate.

A shrub or small tree of better-drained areas from Mexico to the Caribbean coast of Colombia and Venezuela.

HERRERA: Pese, *Allen* 807. PANAMA: near Río Jagua, *Hunter & Allen* 481; Río Tócumén, *Standley* 26685; Punta Paitilla, *Piper* 5426, *Standley* 26314, 30810; between Matías Hernández and Juan Díaz, *Standley* 31989; Matías Hernández, *Standley* 28881; Bella Vista, *Standley* 25333.

6. *TRICHILIA MONTANA* H. B. K., *Nov. Gen. Sp. Pl.* **7**: 226. 1825.—Fig. 5.

Trichilia excelsa Benth., *Hook. Jour. Bot. Kew Gard. Misc.* **3**: 368. 1851.

Trichilia macrophylla Benth., *loc. cit.* 369. 1851.

Trichilia flava C. DC. in *Mart., Fl. Bras.* **11**(1): 203. *t.* 59. 1878.

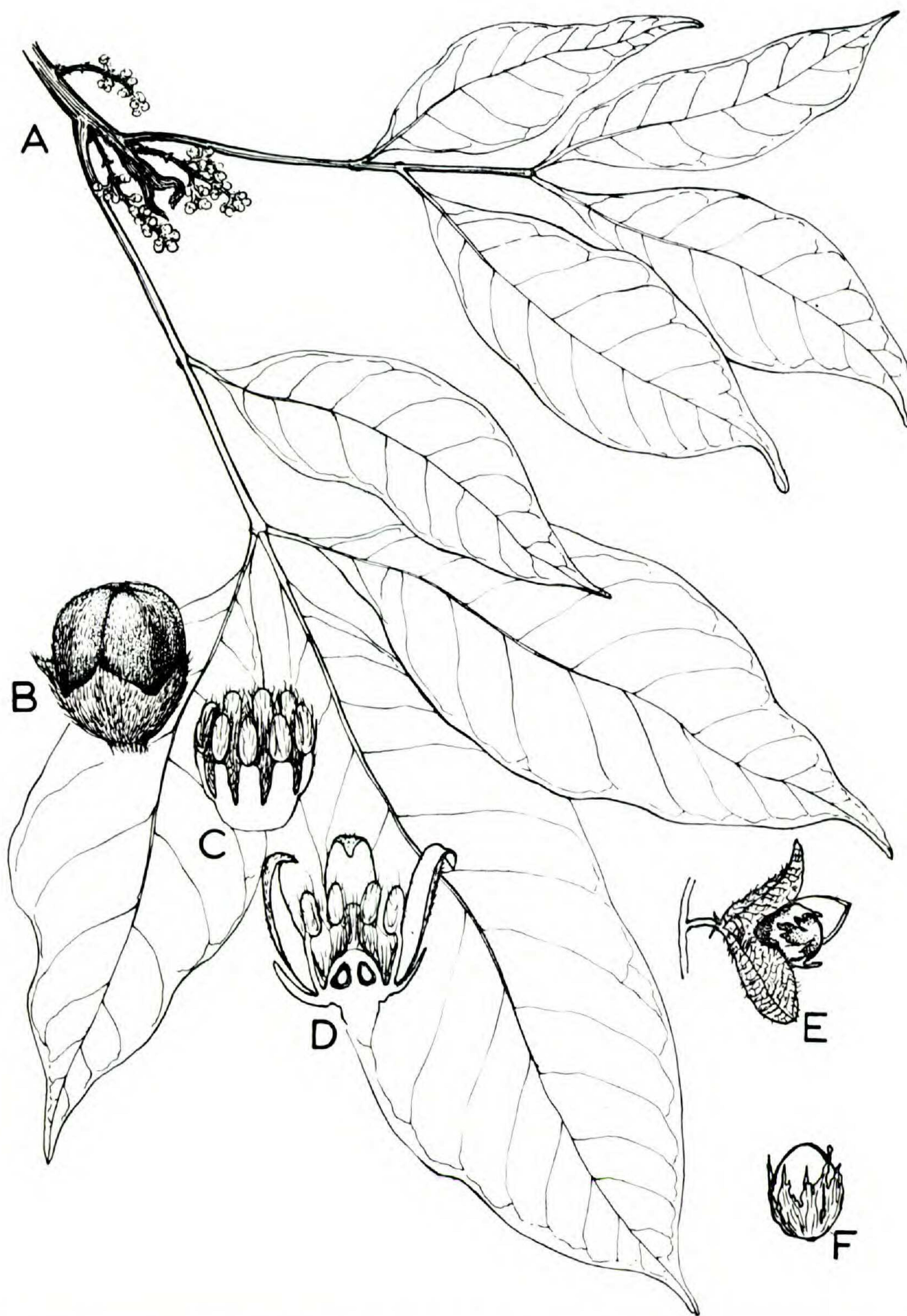


Figure 5. *TRICHILIA MONTANA* H. B. K.: A, habit (ca. $\times \frac{1}{2}$); B, flower bud (ca. $\times 4$); C, androecium (ca. $\times 4$); D, flower, longitudinal section (ca. $\times 4$); E, dehiscent capsule with seed (ca. $\times 1\frac{1}{3}$); F, seed (ca. $\times 1\frac{1}{3}$).

Tree to 25 m. tall. *Leaves* to 20 cm. long, imparipinnate; leaflets 2-3 pairs borne oppositely on the rachis and a terminal leaflet; blades 4-32 cm. long, 2-14 cm. wide, usually broadly-elliptical to obovate, occasionally lanceolate-elliptical, the base acute, sometimes cuneate, the apex usually acuminate, subacute, rarely obtuse, glabrous on both sides, lighter in color beneath. *Inflorescences* axillary, racemose-paniculate, sometimes so short as to appear fascicled, infrequently glabrous, generally scattered-puberulent to pubescent, to about 4 cm. long. *Flowers* white, cream or greenish, 3-4 mm. long, 4- to 6-merous; calyx shallow and deeply lobed, the lobes deltoid, glabrous to pubescent without; corolla glabrous to minutely puberulent without and within; staminal tube $\frac{2}{3}$ the height of the corolla, united on the basal $\frac{1}{2}$, the filaments glabrous without, pubescent within; anthers twice as many as the petals, pubescent; ovary densely pilose with golden trichomes; stigma sphaeroidal-capitate. *Fruit* ellipsoidal, about 1 cm. long, densely velutinous, sometimes transversely striate, occasionally bearing densely produced epidermal protuberances to about 1 mm. long which are densely velutinous; seeds generally 1 per capsule, arillate.

Moist forests from Mexico to Brasil.

BOCAS DEL TORO: s. loc., von Wedel 272, 435. CHIRIQUÍ: San Felix, alt. to 120 m., Pittier 5196; vicinity of San Bartolomé, alt. to 50 m., Woodson & Schery 867; Progreso, Cooper & Slater 212, 235. DARIEN: between Paya and Palo de las Letras, Stern, Chambers, Dwyer & Ebinger 192; near mouth of Río Yapé, Allen 350.

7. *TRICHILIA HIRTA* L., Syst. Nat. ed. 10, 1020. 1759.

Trichilia spondiodes Jacq., Enum. Syst. Pl. 20. 1760.

Trichilia Wawrana C. DC., Monogr. Phaner. **1**: 666. 1878.

Trichilia Pringlei Rose, Contr. U. S. Nat. Herb. **8**: 50. 1903.

Trichilia parvifoliola C. DC., Ann. Conserv. Jard. Bot. Genève **10**: 155. 1907.

Tree to 10 m. tall. *Leaves* to 35 cm. long; leaflets 6-9 pairs (occasionally leaves bear a terminal leaflet) borne oppositely on the rachis; blades 3-10 cm. long, 1.5-4 cm. wide, lanceolate-elliptical to ovate, inequilateral and acute at the base, the apex usually narrowly acuminate, glabrous to pubescent along the veins above and below to scattered-pilose all over, the underside often lighter than the top. *Inflorescences* axillary, racemose, numerous toward the ends of the twigs, 6-14 cm. long, glabrous to puberulent. *Flowers* white to lavender, fragrant, 2-3 mm. long, 4- to 6-merous; calyx small, flat, deeply lobed, the lobes deltoid, glabrous to puberulent without; petals lanceolate-ovate to ovate, glabrous; staminal ring united only on the basal $\frac{1}{3}$, the filaments glabrous without, pilose within near the apex, bearing a pair of apicula at the base of the anther; stamens usually twice as many as the petals; ovary densely pilose, the stigma sphaeroidal-capitate. *Fruit* about 1 cm. long, reddish, densely short-velutinous, occasionally transversely striate as the valves open, 3- to 4-valved, usually 2- to 4-seeded, the seeds red-arillate and persistent.

Trees of fence rows, forest margins and forests from Mexico to Brasil.

CANAL ZONE: Canal Zone Experimental Garden, Lindsay 497. CHIRIQUÍ: vicinity of San Felix, alt. 0-120 m., Pittier 5140. PANAMA: Cabuya, Allen 2557; between Matías Hernández and Juan Díaz, Standley 31953; Las Sabanas, Standley 25876; San José Island, Johnston s. n., 159, 474.

8. *TRICHILIA TOMENTOSA* H. B. K., Nov. Gen. Sp. Pl. **5**: 215. 1822.

Trichilia cuneata Radlk., Sitzungsab. Bayer. Akad. Wiss. Munch., Math.-Phys. Cl. **9**: 642. 1897.

Trichilia Biolleyi C. DC., Bull. Herb. Boiss., ser. 2, **5**: 423. 1905.

Trichilia Biolleyi var. *nicoyensis* C. DC., loc. cit. 424. 1905.

Trichilia acutanthera C. DC., loc. cit. 422. 1905.

Trichilia anisopleura C. DC., loc. cit. 424. 1905.

Trichilia chiriquina C. DC., Smithson. Misc. Coll. **68**(6): 6. 1917.

Trichilia colombiana Cuatr., Field Mus. Nat. Hist., Bot. Ser. **27**(1): 81. 1950.

Tree to 15 m. tall. Leaves to 30 cm. long, imparipinnate; leaflets 3 to 4 pairs borne oppositely on the rachis, 3-29 cm. long, 1.5-11 cm. wide, elliptical to obovate, the base subacute to cuneate, the apex acuminate obtuse to subacute, pubescent on both surfaces or pubescent along the nerves only or nearly glabrous. Inflorescences axillary, paniculate, sometimes markedly congested, 5-30 cm. long, glabrate to velutinous to short-tomentose. Flowers white or cream, 2-3 mm. long, 4- to 6-merous; calyx shallow, deeply deltoid-lobed, glabrate to pubescent without; petals obovate or elliptical, generally minutely velutinous without, glabrate within; stamens twice as many as the petals, united into a shallow cup at the base but free for most of their length, glabrous or glabrate without, bearing a patch of long tomentum at the apex of the filaments within, the filaments truncate or bearing 2 short apicula at either side of the anther; anthers glabrate; ovary densely long-pilose; style short; stigma sphaeroidal-capitate. Fruit to about 1.2 cm. long, generally obpyramidal and opening by 2 or 3 valves, orange-yellow or reddish, the valves densely velutinous and transversely striate; seeds usually 1 per capsule, arillate.

A moderate-sized tree of moist forests ranging from southern Mexico to northern Peru.

BOCAS DEL TORO: Fish Creek Hills, *von Wedel* 2434. CHIRIQUÍ: vicinity of David, *Pittier* 2838; vicinity of Remedios, *Allen* 3477; Progreso, *Cooper & Slater* 214. PANAMA: Chepo, *Kluge* 47; San José Island, *Johnston* 584, 585, 1341.

6. *GUAREA* Allemand ex L.

Guarea Allemand ex L., Mant. Pl. 150, 228. 1771, nom. gen. conserv.

Samyda L., Sp. Pl. 443. 1753.

Ruagea Karst., Fl. Columb. **2**: 51, pl. 126. 1863.

Sycocarpus Britt., Bull. Torrey Bot. Club **14**: 143. 1887.

Trees or shrubs, the Panamanian species all generally tree-like, but may be shrubby from stump sprouts. Leaves pinnate-compound, only rarely with a terminal leaflet, the leaflets opposite or alternate. Inflorescences axillary. Flowers perfect; calyx saucer to cup-shaped or of 5 nearly distinct sepals; petals 4-6; staminal tube urceolate or cylindric, entire or shallowly lobed, anthers 8-12, included or, rarely, barely exerted; ovary 4- to 12-celled, the ovules 1 or 2 per cell, superposed. Fruit a thick or woody-valved capsule loculicidally dehiscent (sometimes tardily so) from the apex; seeds 1 per capsule or 1-2 per locule, more or less arillate, cotyledons fleshy.

As in other genera in the family, the infrageneric taxa are frequently indistinctly separated in *Guarea*. While descriptions for 80 or more species have been published, the number of readily recognizable species is probably less than 35.

- a. Ovary glabrous or sparsely pubescent.
 - b. Leaflets about 3 times longer than broad; veins generally light in color; capsule to 2 cm. in diam.; seeds entirely covered with a red aril.1. *G. GLABRA*
 - bb. Leaflets about twice as long as broad; veins generally dark in color; capsule to 4 cm. in diam.; seeds only about $\frac{4}{5}$ covered by a red aril.2. *G. KUNTHIANA*
- aa. Ovary densely pubescent or sericeous.
 - c. Inflorescence glabrate or only sparingly pubescent; calyx shallowly cupulate, frequently deeply lobed; capsule globose to fig-shaped, usually lenticellate, about 1.5 cm. in diam.3. *G. GUIDONIA*
 - cc. Inflorescence sparsely to densely pubescent; calyx deeply cupulate, usually shallowly lobed; capsules elenticellate.
 - d. Leaflets pubescent along the veins above and below, frequently villose over the entire under surface of the blade; capsule globose, often densely velutinous, to 2.5 cm. in diam.4. *G. TONDUZII*
 - dd. Leaflets only puberulent on the veins above and below or glabrous, the blades sometimes scattered papillose; capsule fig-shaped, pulverulent, to 3 cm. in diam. and 3 cm. long.5. *G. MULTIFLORA*

1. *GUAREA GLABRA* Vahl, *Eclog. Am.* **3**: 8. 1807.

Guarea Swartzii DC., *Prodr.* **1**: 624. 1824.

Guarea excelsa H. B. K., *Nov. Gen. Sp. Pl.* **7**: 227. 1825.

Guarea Schomburgkii C. DC., *Monogr. Phaner.* **1**: 565. 1878.

Guarea Donnell-Smithii C. DC., *Bull. Herb. Boiss.*, ser. 2, **5**: 419. 1905.

Guarea syringoides C. H. Wright, *Kew Bull.* 1906: 3. 1906.

Guarea Rovirosae C. DC., *Ann. Conserv. Jard. Bot. Genève* **10**: 145. 1907.

Guarea brevianthera C. DC., *Smithson. Misc. Coll.* **68**(6): 1. 1917.

Guarea ternifoliola C. DC., loc. cit. 2. 1917.

Guarea parva C. DC., loc. cit. 3. 1917.

Guarea racemiformis Blake, *Contr. U. S. Nat. Herb.* **20**: 241. 1919.

Guarea heterophylla Blake, *Proc. Biol. Soc. Wash.* **34**: 116. 1921.

Guarea polyantha Blake, loc. cit. 117. 1921.

Guarea chiricana Standley, *Trop. Woods* **16**: 18. 1928, nom. nud.; *Field Mus. Nat. Hist.*, Bot. Ser. **4**: 215. 1929.

Tree to 20 m. tall, frequently shorter. *Leaves* approximately 20-40 cm. long; leaflets 2-6 (-10) pairs, lanceolate-elliptical to elliptical, rarely broadly ovate-elliptical, the base generally acute, the apex obtuse to acuminate-obtuse, glabrous to puberulous along the midrib above, glabrous to puberulous to scattered-pilose along the veins beneath (the specimens from the northern Antilles and north and west of Nicaragua on the mainland generally barbate in the axils of the veins beneath). *Inflorescences* shorter than the leaves, 3-20 or more cm. long, generally paniculate, less frequently nearly racemose, puberulent to pubescent. *Flowers* greenish-white to cream or pink, 4- to 5-(-6)-merous; calyx shallowly to definitely cupulate, the divisions often apiculate, glabrous to puberulous, the apicula frequently pubescent; petals spatulate, glabrous to completely puberulent without, usually with a lighter margin; staminal tube entire to obscurely lobed, rarely scattered-puberulent without; anthers 8-10 (-12); ovary glabrous to scattered-hirsute, borne on a narrow gynophore. *Capsule* red, glabrous, usually 4-valved, the largest seen about 2 cm. in

diam., nearly globose, sometimes obscurely 4-sided, 4-seeded; seeds apparently always entirely covered by a red aril.

A medium-sized tree of broad distribution in the forests of the West Indies, Mexico to Colombia, Ecuador and Venezuela and, perhaps, to Bolivia.

CANAL ZONE: Barro Colorado Island, *Zetek* 15001; Río Indio de Gatún, *Pittier* 2810. CHIRIQUÍ Remedios and vicinity, alt. 0-100 m., *Pittier* 5466; Progreso, *Cooper & Slater* 164, 168, 212, 229, 250. DARIEN: headwaters of the Río Chico, alt. 500-750 ft., *Allen* 4625; vicinity El Real, Río Tuira, *Stern, Chambers, Dwyer & Ebinger* 111; vicinity of Paya, Río Paya, *Stern, Chambers, Dwyer & Ebinger* 182.

2. *GUAREA KUNTHIANA* A. Juss., Mèm. Mus. Hist. Nat. Paris **19**: 290. 1830.

Guarea Poeppigii Tr. & Pl., Ann. Sci. Nat., Bot., ser. 5, **15**: 371. 1872.

Guarea erythrocarpa C. DC., Bull. Herb. Boiss., ser. 2, **5**: 420. 1905.

Guarea Caoba C. DC., loc. cit. 421. 1905.

Guarea Cook-Griggsii C. DC., Smithson. Misc. Coll. **68**(6): 2. 1917.

Guarea Williamsii C. DC., loc. cit. 4. 1917.

Guarea Steinbachii Harms, Notizbl. Bot. Gart. Mus. Berlin **10**: 348. 1928.

Guarea Matudai Lundell, Lloydia **2**: 93. 1939.

Guarea macrantha Standley & Williams, Ceiba **1**: 240. 1951.

Tree to about 25 m. tall, frequently shrubby at higher elevations in Central America. Leaves approximately 18-40 cm. long; leaflets 2-3(-5) pairs, broadly elliptical, occasionally broadly obovate, the base obtuse to acute, the apex obtuse to obtusely long-acuminate, the veins frequently darker than the blade beneath, glabrous above and beneath, rarely minutely puberulent along the veins beneath. Inflorescences shorter than the leaves (rarely elongate in specimens from the upper Amazon drainage), often cauliflorous, 3-18 cm. long (in specimens seen from Panama), paniculate, rarely nearly racemose, glabrous, infrequently minutely puberulent. Flowers white or cream, sometimes tinged with rose, 4 (rarely 5)-merous; calyx cupulate, frequently split at one side, the lobes rounded to very short minutely puberulent without; staminal tube usually entire, glabrous; anthers 8 (-10); ovary glabrous, borne on a thick gynophore. Capsule dull red, glabrous, usually 4-valved, the largest capsule seen about 4 cm. in diam., usually definitely 4-lobed, shorter than broad, sometimes lenticellate, 4-celled, with 1 or 2 seeds per cell; seeds $\frac{4}{5}$ covered by a red aril, the remaining $\frac{1}{5}$ covered by a white caruncle on the axial side.

Apparently nearly restricted to the lowland forest from southern Mexico to Bolivia.

CANAL ZONE: west of Limon Bay, Río Piña-Río Media divide, *Johnston* 1700. CHIRIQUÍ: Bajo Chorro, Boquete District, alt. 6,000 ft., *Davidson* 46. DARIEN: trail between Paya and Palo de las Letras. *Stern, Chambers, Dwyer & Ebinger* 213; Boca de Cupe, *R. S. Williams* 683.

3. *GUAREA GUIDONIA* (L.) Sleumer, Taxon **5**: 194. 1956.—Fig. 6.

Samyda guidonia L., Sp. Pl. 443. 1753.

Melia Guara Jacq., Enum. Syst. Pl. 20. 1760.

Trichilia Guara (Jacq.) L., Sp. Pl. ed. 2, 551. 1762.

Guarea Guara (Jacq.) P. Wilson, N. Am. Fl. **25**: 272. 1924.

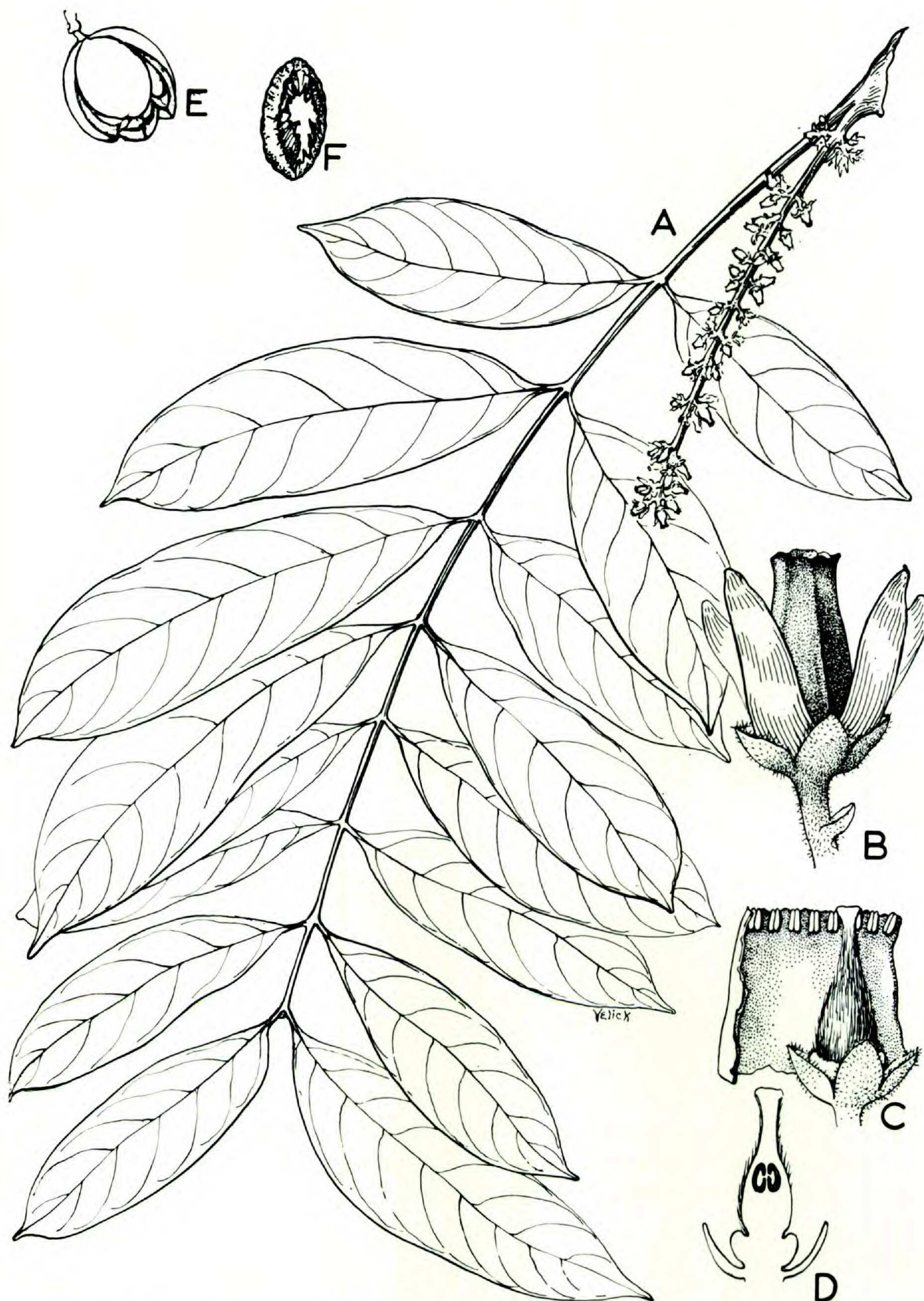


Figure 6. *GUAREA GUIDONIA* (L.) Sleumer: A, habit (ca. $\times \frac{1}{2}$); B, flower (ca. $\times 4$); C, id., petals removed, the staminal tube opened (ca. $\times 4$); D, longitudinal section of the gynoecium (ca. $\times 4$); E, dehiscent capsule (ca. $\times \frac{1}{2}$); F, seed (ca. $\times 1$).

- Guarea trichilioides* L., Mant. Pl. 228. 1771.
Guarea trichilioides var. *brachystachya* C. DC., Monogr. Phaner. **1**: 544. 1878.
Guarea trichilioides var. *pallida* C. DC., loc. cit. 544. 1878.
Guarea trichilioides var. *pachycarpa* C. DC., loc. cit. 544. 1878.
Guarea trichiloides var. *colombiana* C. DC., Ann. Conserv. Jard. Bot. Genève **10**: 138. 1907.
Guarea trichiloides var. *decandra* C. DC., loc. cit. 139. 1907.
Guarea rubra C. DC., Monogr. Phaner. **1**: 556. 1878.
Guarea Langsdorffiana C. DC., loc. cit. 557. 1878.
Guarea subspicata C. DC., Ann. Conserv. Jard. Bot. Genève **10**: 143. 1907.
Guarea puberula Pittier, Bol. Soc. Venez. Cienc. Nat. **4**: 357. 1938.

Tree to 25 m. tall, sometimes shrubby. Leaves 10-50 cm. long; leaflets 4-7 pairs (occasionally there is a terminal leaflet), elliptical or lance-elliptical, rarely broadly elliptical, the base subacute to acute, the apex obtuse to acuminate-subacute, glabrous to puberulent along the veins above and below, the rachis glabrous, the blade rarely minutely scattered-papillose. Inflorescences axillary, 4-35 cm. long, paniculate, frequently strict, glabrate to sparsely pubescent. Flowers white to yellow, rarely pink, 4- to 5-merous; calyx shallowly cupulate, shallowly to deeply lobed, lobes rounded to deltoid, occasionally apiculate, glabrate to puberulent particularly on the apiculum; petals scattered-puberulous to densely puberulent without, glabrous to puberulent within; staminal tube nearly entire to crenulate to deltoid-dentate, glabrous; anthers 8 (-10); ovary sparingly to densely pubescent, borne on a glabrous gynophore. Capsule light to dark-rufous-brown, frequently lenticellate, globose to fig-shaped, nitid-glabrous to pulverulent, 4(-5)-valved, 4(-5)-celled, the cells 1-seeded; seeds about $\frac{3}{4}$ covered by a red aril; the largest capsule seen about 1.5 cm. in diam.

Widely distributed in the American tropics.

CANAL ZONE: along Quebrada Morito, Johnston 1578, 1634; mouth of Río Chagres, Johnston 1772; Arraiján, Woodson, Allen & Seibert 780; Barro Colorado Island, Woodworth & Vestal 747; Gatuncillo, Piper 5626. CHIRIQUÍ: Boquete District, Bajo Choro, Davidson 712. DARIEN: Boca de Cupe, R. S. Williams 685; Marraganti, R. S. Williams 633. PANAMA: Río Tócumén, Standley 29343, 29352.

While this species has long been known as *Guarea trichilioides* through much of its range and as *G. Guara* in Panama, Sleumer (loc. cit. 1956) pointed out the existence of an earlier name for the species in another genus. This name is based on interpretations of Plumier's descriptions of 1703 in *Nova Plantarum Americanum genera*, and the description and plate in the Burmann edition of Plumier's work, *Plantarum Americanarum*, of 1755-60 and the intervening and subsequent history of use by other authors. Urban had identified the plate in 1920 as *G. trichilioides* but had not made the nomenclatural transfers required by priority. There can be no doubt about the identity of the plant illustrated.

Since the correct identification of the plate also provides an earlier name for the genus *Guarea*, Sleumer proposed the conservation of the generic name *Guarea* Allemand ex L. over the generic name *Samyda* L. but the Committee for Spermatophyta Conservation of Generic Names felt that this was unnecessary as *Samyda* L. is automatically rejected under the present wording of the Code (Regnum Vegetabile **23**: Art. 14, Note 3. 1961) (See, Taxon **9**: 15. 1960).

4. *GUAREA TONDUZII* C. DC., *Smithson. Misc. Coll.* **68**(6):4. 1917.

Tree generally less than 15 m. tall. *Leaves* about 5-45 cm. long, leaflets 2-3 (-5) pairs, broadly ovate-elliptical to elliptical, the base obtuse to acute, the apex usually acuminate, obtuse, the blade usually densely pubescent along the veins above, villous over the entire under surface, rarely pubescent along the veins only, with scattered pubescence on the blade beneath. *Inflorescences* shorter than the leaves, cauliflorous, 6-16 cm. long, paniculate, densely pubescent. *Flowers* light-cream to pinkish-tan, 4-merous; calyx cupulate, split on one side, the lobes rounded, densely pubescent, rarely sparsely pubescent; petals spatulate, densely pubescent, rarely sparsely pubescent without, glabrous within; staminal tube slightly crenulate, sparsely pubescent to glabrous without; anthers 8; ovary densely pubescent, rarely sparsely pubescent or glabrous, borne on a thick, glabrous gynophore. *Capsule* red to reddish-brown, oblate-sphaeroidal, densely velutinous to glabrous, 4-valved, occasionally with 1 seed per locule, frequently only with 1 seed developing per fruit; the largest fruit seen about 2.5 cm. in diam.; seeds apparently entirely covered by a red aril.

Costa Rica and Panama.

CANAL ZONE: Barro Colorado Island, *Carpenter* 71. CHIRIQUÍ: vicinity of Boquete, alt. 5,500 ft., *Stern, Chambers, Dwyer & Ebinger* 1090. DARIEN: trail between Paya and Pucro, *Stern, Chambers, Dwyer & Ebinger* 398.

5. *GUAREA MULTIFLORA* A. Juss., *Mém. Mus. Hist. Nat. Paris* **19**: 284. 1830.

Sycocarpus Rusbyi Britt., *Bull. Torrey Bot. Club* **14**: 143. 1887.

Guarea Rusbyi (Britt.) Rusby, *Mem. Torrey Bot. Club* **6**: 17. 1896.

Guarea culebrana C. DC., *Smithson. Misc. Coll.* **68**(6):5. 1917.

Guarea longipetiolata C. DC., loc. cit. 5. 1917.

Guarea Pittieri C. DC., loc. cit. 6. 1917.

Guarea fissicalyx Harms, *Notizbl. Bot. Gart. Mus. Berlin* **11**: 383. 1932.

Guarea Mancharra Cuatr., *Field Mus. Nat. Hist., Bot. Ser.* **27**(1):71. 1950.

Tree to 50 m. tall, frequently flowering when only 6-10 m. tall, occasionally shrubby (sprout clumps?). *Leaves* 0.15-2 m. long; leaflets 4-17 pairs, elliptical to lanceolate-elliptical, rarely ovate or subovate, the base subacute to rounded, the apex subacute to obtuse, frequently acuminate obtuse, glabrous or puberulent along the veins above and below, then the petiolules and the rachis puberulent, sometimes scattered papillose on the blade. *Inflorescences* generally axillary, 8-35 cm. long, paniculate, sparsely to densely puberulent. *Flowers* white or yellow, 4- to 6-merous; calyx frequently reddish or orange, cupulate, split on one side, the lobes rounded, sometimes apiculate, glabrate to puberulent or pubescent; petals densely puberulent to sericeous without, glabrous within; staminal tube entire to somewhat crenulate, glabrous or sparingly puberulent without; anthers 8-12; ovary densely pubescent, borne on a thick, glabrous gynophore. *Capsule* apparently rufous-brown, fig-shaped, pulverulent, 4- to 6-valved, 4- to 6-celled; generally 1, sometimes 2 seeds developing per cell; the largest fruit seen about 3 cm. long and 3 cm. in diam.;

seeds about $\frac{7}{8}$ covered by a red aril, about $\frac{1}{8}$ showing a soft, white caruncular growth.

Frequent in lowland forest from southern Mexico to Bolivia.

BOCAS DEL TORO: Cocoa Cay, *von Wedel* 2874; Changuinola Valley, *Dunlap* 506. CHIRIQUÍ: Progreso, *Cooper & Slater* 208; vicinity of San Bartolomé, *Woodson & Schery* 923. COLÓN: Río Culebra above Sta. Isabel, *Pittier* 4160. DARIEN: near Garachiní, *Pittier* 5697; Boca de Pauarandó, Sambú River, *Pittier* 5580. PANAMA: San José Island, *Erlanson* 488, *Johnston* 1, 645.

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